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# Do changes in eating behaviors signal rising mental health concerns among Saudi high schoolers?

Ayesha Mumtaz<sup>1</sup>, Abdullah Addas<sup>2,3</sup>, Wusi Zhou<sup>1\*</sup> and Shazia Rehman<sup>4,5</sup>

## Abstract

**Background** Deteriorated eating attitudes have emerged as a prominent psychiatric illness with increasing prevalence in industrialized societies. This research endeavors to investigate the relationships between deteriorated eating patterns and mental health among Saudi high school students after the COVID-19 outbreak.

**Methods** A sample of 2817 students from two high schools in Jeddah, Saudi Arabia, completed a questionnaire about their demographic characteristics and symptoms of anxiety (GAD-7), depression (PHQ-9), and deteriorated eating patterns (Eating Attitudes Test 26) via convenience sampling technique. Multiple regression analysis was carried out to predict the potential associations between deteriorated eating patterns and levels of anxiety and depression among the study participants.

**Results** The findings demonstrated a moderate and statistically significant correlation between deteriorated eating patterns and levels of anxiety and depression among the participants in the study. In evaluating the three dimensions of deteriorated eating patterns through regression analysis, it is observed that dieting (anxiety:  $\beta = 0.275$ , depression:  $\beta = 0.287$ ) exhibits the highest potential in predicting the levels of anxiety and depression, followed by oral control (anxiety:  $\beta = 0.240$ , depression:  $\beta = 0.232$ ) and bulimia & food preoccupation (anxiety:  $\beta = 0.218$ , depression:  $\beta = 0.186$ ).

**Conclusions** The findings highlight the necessity to place additional emphasis on students displaying deteriorated eating patterns and symptoms, as these individuals may potentially be experiencing accompanying mental health concerns warranting further assessment.

**Keywords** Anxiety, COVID-19, Deteriorated eating patterns, Depression, Saudi high schoolers

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## Introduction

According to recent statistics published by the World Health Organization (WHO), a significant proportion of the worldwide population between the ages of 10 and 19 faces psychological disorders, including but not limited to depression, anxiety, and stress [1]. These conditions are attributed to a confluence of physical, emotional, and social transformations experienced during this developmental stage. The aforementioned psychological conditions can lead to suboptimal academic achievements, diminished interpersonal connections with friends and family, substance dependency, and potentially suicidal thoughts [2–4]. Nevertheless, the majority of instances have remained undetected and unaddressed primarily due to the reticence of adolescents to actively pursue assistance for psychological issues owing to apprehensions surrounding confidentiality breaches and the fear of derision from their peers [5]. Furthermore, these prevailing circumstances have the potential to perpetually undermine their overall well-being, both physically and psychologically, thereby constraining their prospects for attaining a satisfactory and gratifying existence during their transition into adulthood [6]. Ascertaining and addressing psychological health issues in adolescents hold substantial significance.

A plethora of empirical investigations have revealed a substantial correlation between several mental health disorders and the manifestation of deteriorated eating patterns [7–9]. An investigation determined that depression constitutes one of the developmental correlates associated with atypical eating patterns in the adolescent population of Australia [10]. Moreover, within a cohort of undergraduate students, there was found to be a noteworthy positive association between instances of depression and the presence of irregular dietary attitudes. Conversely, a negative correlation emerged between depression and body image perception [11–14]. This aligns with the understanding that depression can lead to feelings of worthlessness or low self-esteem, which may affect how individuals perceive their bodies. This distorted perception of oneself can result in an unfavorable body image. Moreover, individuals experiencing depression may exhibit cognitive biases that lead them to hyper-focus on and magnify perceived imperfections, thereby exacerbating their negative body image. [15]. Social comparisons, common among those with depression, may also play a role, as individuals compare themselves unfavorably to others, leading to a more negative body image. Finally, depression can result in behavioral changes, such as decreased physical activity or altered eating habits, which can further influence body image perception [16]. According to a study, the occurrence of depression and anxiety plays a significant role in linking insomnia with abnormal eating attitudes among female college students

[17]. It has been posited that within clinical populations of adolescents, the presence of anxiety and depression serves as potential mediators in the association between perfectionism and the manifestation of deteriorated eating patterns [18].

Mediators are conceptualized as intermediary variables that elucidate the underlying process by which an independent variable influences a dependent variable [19]. In the present study, it is hypothesized that anxiety and depression may function as mediators in the association between perfectionism and impaired eating behaviors in adolescent populations. Comprehension of these mediators can offer a deeper understanding of the fundamental psychological mechanisms and contribute to developing more efficacious interventions. Perfectionism establishes excessively high internal expectations and pursues flawlessness, leading to substantial psychological strain [20]. The manifestation of stress commonly presents as anxiety and depression, which are prevalent among individuals who exhibit perfectionistic tendencies [21]. *Egan, Wade, and Shafran (2011)* [22] revealed a significant positive correlation between perfectionism and elevated levels of anxiety and depressive symptoms in adolescent individuals. Negative emotional states may subsequently impact eating behaviors and body image. Anxiety and depression may function as mediators that amplify the adverse impact of perfectionism on eating behaviors [23]. Anxiety has the potential to result in heightened contemplation of body image and weight, leading adolescents to adopt counterproductive eating behaviors as a means of coping [24]. The psychological state of depression, characterized by a sense of inadequacy and diminished self-worth, has been observed to impact body image perception and promote disordered eating behaviors. *Egbert et al. (2020)* [25] revealed that depressive symptoms play a significant mediating role in the association between perfectionism and disordered eating among adolescent girls. The comprehension of this mediation pathway holds significant clinical implications.

Besides anxiety and depression, several other well-documented risk factors are implicated in the onset of eating disorders in adolescence. There is a strong correlation between negative affect, encompassing a variety of negative emotions and negative self-perception, and the manifestation of disordered eating behaviors [26]. During adolescence, individuals who are confronted with elevated levels of negative affect may adopt maladaptive eating behaviors as a means of coping. Perfectionism constitutes a significant risk factor. Adolescents exhibiting perfectionistic traits frequently establish impractical benchmarks for themselves, particularly with their body image and weight. The continual strive for these unattainable standards may result in maladaptive eating habits and heightened susceptibility to developing eating

disorders. The phenomenon of body dissatisfaction, characterized by a negative assessment of one's body size, shape, or weight, carries significant importance. It has been established that adolescents experiencing body dissatisfaction are more prone to engaging in disordered eating behavior in the pursuit of attaining their idealized body image [13]. During the adolescent stage, peer pressure assumes a significant role. The susceptibility of adolescents to peer influence significantly affects their eating behaviors and body image perceptions. The influence of peer pressure on adolescents' dietary habits is considerable, with individuals often modifying their eating behaviors to conform to the prevailing social norms and expectations surrounding body image and dieting practices. Barberis et al. (2022) [27] elucidated the motivational mechanisms driving peer pressure and its implications for eating behaviors, underscoring the significance of considering peer influence in treating eating disorders among individuals within this demographic. Through the identification of anxiety and depression as significant mediators, interventions can be formulated to address these psychological factors specifically. Cognitive-behavioral therapy (CBT) and other therapeutic modalities targeting anxiety and depression have the potential to attenuate the influence of perfectionism on eating behaviors, ultimately yielding improved outcomes for adolescents grappling with these challenges. Subsequent research endeavors should examine this mediation pathway, with a specific emphasis on longitudinal studies, as they are integral in ascertaining causal relationships. Moreover, a thorough exploration of additional potential mediators and moderators, such as self-esteem and social support, could yield a more comprehensive insight into the intricate interrelationships among perfectionism, anxiety, depression, and eating behaviors.

Multiple plausible biological justifications exist for the correlation between dietary patterns and mental well-being among adolescents. In the context of dietary quality, it is essential to note that deficiencies in nutrient-dense foods have been linked to psychological health complications. Specifically, an inadequate intake of essential nutrients such as folate, zinc, magnesium, and long-chain omega-3 fatty acids has been associated with the development of depressive and anxiety disorders [28, 29]. Another plausible explanation related to the mediating role of dietary patterns in the pathophysiological and biological systems underlying psychological issues includes the direct impact of dietary intake on biomarkers related to inflammation, the immune system, and oxidative stress, which are implicated in the manifestation of conditions such as depression or anxiety. Research has elucidated a direct correlation between inadequate dietary intake and augmented levels of inflammation and oxidative stress, ultimately culminating in the manifestation of

mental disorders [30, 31]. Additionally, diets characterized by excessive intake of simple sugars and saturated fats may impact proteins implicated in brain development, such as brain-derived neurotrophic factors [32].

### **The present study**

The present research aims to investigate the intricate dynamics of deteriorated eating patterns and their associations with anxiety and depression among high school students in Saudi Arabia. The study focused on the demographic of high school students in Saudi Arabia, intending to comprehend the distinctive cultural and socio-economic elements that impact their dietary patterns and perceptions of body image. Saudi Arabia constitutes a unique environment where traditional values intersect with modern lifestyle changes, owing to its swift socio-economic development and cultural transitions. The adolescents within this geographical area encounter distinct challenges, such as alterations in dietary habits, heightened exposure to Western media ideologies, and the development of evolving social norms. These various factors can affect an individual's mental well-being and perception of their physical appearance. The primary objective of this research is to examine this particular demographic to offer culturally and contextually pertinent findings, thereby enhancing the efficacy of intervention approaches tailored to the population's specific needs. Consequently, our hypotheses are structured to reflect these aims:

**Hypothesis 1** There exists a positive association between deteriorated eating patterns and the level of anxiety among Saudi high schoolers.

**Sub-hypothesis 1a** *Higher levels of dieting behaviors are associated with higher levels of anxiety.*

**Sub-hypothesis 1b** *Increased bulimia and food preoccupation are positively correlated with higher anxiety levels.*

**Sub-hypothesis 1c** *Higher levels of oral control are associated with higher anxiety levels.*

**Hypothesis 2** There exists a positive association between deteriorated eating patterns and the level of depression among Saudi high schoolers.

**Sub-hypothesis 2a** *Higher levels of dieting behaviors are associated with higher levels of depression.*

**Sub-hypothesis 2b** *Increased bulimia and food preoccupation are positively correlated with higher depression levels.*

**Sub-hypothesis 2c** *Higher levels of oral control are associated with higher depression levels.*

## Materials and methods

### Data source and study population

A cross-sectional design with a convenience sampling method encompassed 2,817 students from two local high schools in Jeddah, Saudi Arabia. The data collection process took place over three months, between January–March 2023. Considering individuals under the age of majority, informed consent was obtained from either a parent or legal guardian in compliance with ethical protocols. The research proposal received formal approval from the Ethics Committee of King Abdul Aziz University, Jeddah (ref: 9142/2022).

Participants received assistance from teachers in completing the questionnaires. Prior to this, teachers were thoroughly briefed about the study's objectives and provided with detailed guidelines to help them aid participants during the completion of the questionnaires. Each instrument was administered in its original language. The survey questionnaires adhered to the principles of anonymity and voluntary participation. Each participant was provided with explicit information regarding their entitlement to determine their involvement in the study, emphasizing their prerogative to decline or discontinue participation at any given point.

To ensure a comprehensive and transparent data collection procedure, additional measures were implemented. The recruitment process involved direct communication with students during school assemblies, where the purpose and implications of the study were explained. Students who expressed interest were provided with parental consent forms. Those who returned the signed consent forms were included in the study. The personnel involved in data collection consisted of research assistants who were specifically trained to administer the questionnaires. These assistants worked closely with teachers to coordinate the logistics of data collection within the school settings. The questionnaires were administered in a designated space within the schools to ensure privacy and minimize distractions. The questionnaires were administered electronically using tablets, allowing for efficient data entry and ensuring anonymity. The electronic system also facilitated immediate data encryption and storage in secure servers to protect participant information. All data collected were treated with strict confidentiality, in line with ethical protocols approved by the Ethics Committee.

Of 3,010 individuals approached, 193 students chose not to partake, yielding a response rate of 93.59% (2,817 respondents). Non-participation was primarily due to lack of parental consent or personal disinterest. All

participants were assured that non-participation would not affect their standing in any way.

### Instruments

**Demographics** A survey comprising four questions was used to gather demographic information, including the age, ethnicity, gender, and highest level of education of the participant's parents.

**Depression:** The Patient Health Questionnaire (PHQ-9) was employed as a tool to assess and quantify the manifestation of depressive symptoms [33, 34], which is a valid and reliable instrument across different populations [35–38], including the Saudi population in its original form [39, 40]. The items are evaluated on a 4-point Likert scale. For instance, “Over the last two weeks, how often have you been bothered by feeling down, depressed, or hopeless?” (0: not at all, 1: Several days, 2: More than half the days, and 3: nearly every day). These evaluations generate a cumulative score from 0 to 27, reflecting the extent of impairment experienced within the preceding 14-day period. The reliability coefficient in our sample yielded an estimated value of 0.89.

**Anxiety:** The Generalized Anxiety Disorder Scale (GAD-7) is a widely utilized 7-item rating scale that is grounded in the diagnostic criteria of the DSM-4 for GAD [41]. The items within the study were assessed using a 4-point Likert scale. For instance, “Over the last two weeks, how often have you been bothered by feeling nervous, anxious, or on edge?” (0: Not at all, 1: Several days, 2: More than half the days, and 3: Nearly every day.” The total score, ranging from 0 to 21, indicates the level of impairment experienced over the preceding two-week period. A numerical threshold of a score of 10 or above implies the manifestation of clinically substantial levels of anxiety. This scale has been validated in several contexts and languages [42–45], including the Saudi population [46, 47], with a reliability of 0.85 to 0.92. In our sample, a high level of reliability was observed, as evidenced by Cronbach's alpha coefficient of 0.90.

**Eating attitudes:** The eating attitudes of the participants in the study were evaluated by employing the Eating Attitude Test 26 (EAT- 26) [48]. The scale incorporates three principal dimensions: dieting with 13 items; bulimia & food preoccupation, comprising six items; and oral control, represented by seven items. The participants' responses were recorded using a 5-point Likert scale. For instance, “I have gone on eating binges where I feel that I may not be able to stop” was recorded on 0: Never, 1: Rarerly, 2: Sometimes, 3: Often, and 4: Always. An increase in the cumulative score of all items is positively associated with a more significant divergence of the participants' eating attitude from the norm. This instrument has been widely used and has demonstrated adequate validity and reliability in various populations

**Table 1** Factor loadings for each item of the selected scales

	GAD-7	PHQ-9	EAT-26		
			A	B	C
Item 1	0.74	0.69	0.76	0.75	0.70
Item 2	0.69	0.70	0.71	0.70	0.68
Item 3	0.70	0.71	0.72	0.69	0.71
Item 4	0.75	0.76	0.71	0.71	0.72
Item 4	0.68	0.75	0.77	0.75	0.68
Item 6	0.69	0.68	0.67	0.68	0.70
Item 7	0.67	0.72	0.65		0.66
Item 8		0.70	0.70		
Item 9		0.69	0.71		
Item 10			0.72		
Item 11			0.71		
Item 12			0.70		
Item 13			0.69		

Note: A: dieting, B: Bulimia & food preoccupation, C: oral control, EAT: eating attitude test GAD-7: generalized anxiety disorder 7, PHQ-9: patient health questionnaire 9

**Table 2** Discriminant validity, reliability, and construct validity analysis results

	GAD-7	PHQ-9	EAT-26	Cut off
Basement effect	2.9%	1.6%	3.2%	< 15%
Ceiling effect	3.3%	2.1%	3.7%	< 15%
McDonald's omega	0.88	0.84	0.81	≥ 0.7
Cronbach's alpha	0.90	0.89	0.89	≥ 0.7
Ferguson's delta	0.978	0.988	0.983	≥ 0.9
$\chi^2/df$	2.85	2.91	2.78	< 3
CFI	0.988	0.993	0.973	≥ 0.95
TLI	0.976	0.985	0.966	≥ 0.95
RMSEA	0.054	0.052	0.054	< 0.08
SRMR	0.041	0.045	0.040	< 0.08
AVE	0.654	0.601	0.683	> 0.5

[49–52], including Saudi population in its original form [53, 54].

### Statistical analysis

Before conducting the analysis, the normal distribution of the data was assessed by employing the Kolmogorov-Smirnov test. This statistical test was executed utilizing the SPSS software version 26.0. The results of this test validated the normality assumption for all the variables incorporated in this study. A bivariate correlational analysis was carried out to explore the interconnections between the GAD-7, PHQ-9, and EAT-26 scales, thus providing evidence of multicollinearity among the variables. The reliability analysis, construct validity and model fit statistics were computed for the scale variables using AMOS v.24. Multiple regression analysis was then conducted to explore the possible associations among the study variables. The statistical significance level utilized in the present study was  $p < 0.05$ .

**Table 3** Socio-demographic analysis of the study participants ( $n = 2,817$ )

Variables	Category	f (%) / Mean (SD)	p-value
Age (years)	15–17	16.31 (0.843)	< 0.034
Gender	Male	1,521 (53.99%)	< 0.001
	Female	1,296 (46.01%)	
Ethnicity	Saudi	2,422 (85.98%)	< 0.352
	Other Arab	253 (8.98%)	
	South Asian	98 (3.48%)	
	Other	44 (1.56%)	
Parental educational level	High school diploma	1,015 (36.03%)	< 0.023
	Bachelor's degree	1,245 (44.20%)	
	Master's degree	557 (19.77%)	

Note: Significant at 5% and 1%

### Results

Table 1 displays the findings of confirmatory factor analysis loadings of the psychometric constructs utilized in the current investigation. The observed outcomes demonstrated strong item discrimination for all scales, as evidenced by factor loadings exceeding 0.6 for each scale item. These findings suggest that all items accurately and faithfully represent their respective scales.

Table 2 illustrates the findings of the reliability analysis, as well as the assessment of discriminant and divergent validity for the psychometric constructs. The reliability analysis was evaluated using Cronbach's alpha coefficient and McDonald's omega. The assessment of construct validity involved the examination of model fit statistics and the average variance extracted index. The study's results demonstrated a satisfactory degree of reliability and validity to the GAD-7, PHQ-9, and EAT-26 scales.

Table 3 provides a summary of the socio-demographic characteristics of the individuals involved in the study. The study involved 2817 participants with a mean age of 16.31 years with a standard deviation of 0.843. The sample comprised 53.99% male ( $n = 1521$ ) and 46.01% female ( $n = 1296$ ) participants, demonstrating a statistically significant distribution ( $p < 0.001$ ). The predominant distribution of ethnicity within the studied population was Saudi (85.98%), followed by other Arab individuals (8.98%), South Asians (3.48%), and individuals from other ethnic backgrounds (1.56%). The differences in distribution among these groups were not statistically significant ( $p = 0.352$ ). Regarding parents' educational level, 36.03% held a high school diploma, 44.20% held a bachelor's degree, and 19.77% held a master's degree, indicating a statistically significant disparity ( $p = 0.023$ ).



Furthermore, Pearson bivariate correlation analysis was performed to determine the bivariate correlations among the chosen scales, and the results are presented in Table 4. The findings illustrated a moderate positive association between GAD-7 and PHQ-9 ( $r=0.438$ ;  $p<0001$ ), as well as between PHQ-9 and EAT-26 ( $r=0.483$ ;  $p<0001$ ). However, it was observed that the bivariate association between EAT-26 and GAD-7 was slightly more substantial ( $r=0.594$ ;  $p<0001$ ). All correlation values exhibited statistical significance at  $p<0.001$ , indicating a significant relationship between the variables. Moreover, no multicollinearity was observed within the scales, suggesting that the predictor variables were not highly correlated.

The present study employed an ordinal regression analysis to predict the potential influence of eating attitudes on anxiety and stress levels exhibited by the participants. The obtained outcomes are subsequently presented in Table 5. The findings indicate a statistically significant correlation between the levels of anxiety and depression and the three dimensions of eating attitudes observed in the participants. However, it has been observed that dieting displays a higher propensity to predict anxiety and depression levels when compared to bulimia & food preoccupation, as well as oral control.

## Discussion

The primary objective of this study was to explore the associations between deteriorating eating attitudes and the prevalence of anxiety and depression in Saudi high school students, with a specific focus on the impact of the COVID-19 pandemic. The findings revealed statistically significant correlations between deteriorating eating attitudes and symptoms of anxiety and depression. Among the disordered eating attitudes, dieting was observed to have the most robust predictive power, followed by oral control, bulimia & food preoccupation. The results of this study provide significant insight into the relationship between mental health and eating behaviors in adolescents, building upon and supporting the current body of literature on the subject.

Our study demonstrates that dieting exhibits the most significant correlation with anxiety and depression when compared to other aspects of eating attitudes corroborating a prior systematic review suggesting a strong association between deteriorating eating behaviors and elevated

psychological distress [55]. Research indicates that individuals adhering to stringent dietary limitations are at an increased risk of exhibiting symptoms associated with anxiety and depression, plausibly attributed to the compounded stress and physiological repercussions stemming from suboptimal nutritional intake [56, 57]. The findings are consistent with prior pieces of evidence conducted in different secondary educational institutions, which demonstrated a notable prevalence of both depression and anxiety [58–60]. Such occurrences could be attributed to several factors, such as variations in familial relationships, academic achievement, and socio-cultural backgrounds [61]. The influence of parental expectations and family conflict on adolescent mental health has been a subject of notable research, revealing a significant impact [62]. Elevated parental expectations may precipitate psychological strain, anxiety, and mood disturbances in adolescents [63]. Moreover, familial discord and insufficient support can compound these psychiatric concerns, generating a problematic atmosphere for adolescents [64]. In addition, the mental health of students can be significantly affected by the pressures of academic achievement, particularly within competitive educational settings [65]. The correlation between academic stress and elevated levels of anxiety and depression has been established, especially in environments that prioritize achievement and success [66]. The manifestation of stress may arise from many sources, such as an excessive workload, examination pressures, and the expectations to attain superior academic performance.

Similarly, societal norms and peer influences play a critical role in shaping the mental health outcomes of adolescents [67, 68]. The societal norms and expectations about physical appearance, achievement, and conduct have been associated with the development of anxiety and depression. One illustrative example is the impact of societal pressures on individuals to adhere to specific body standards, which can result in dissatisfaction with one's body and the development of disordered eating patterns [13]. The influence of peer pressure and the aspiration to conform to social groups can contribute to the exacerbation of these issues, resulting in heightened mental health challenges among adolescents [27, 69]. This proposition alludes to the necessity of further emphasizing the dietary habits exhibited by the student population. As a result of concerns about contracting the virus and limited social interaction, students faced an increased likelihood of experiencing mental health issues throughout the pandemic [70]. The findings demonstrated that students scored lower on dieting, bulimia, preoccupation with food, knowledge of food content, and the overall scale. However, they scored higher when it came to compensatory behavior. Therefore, it is crucial

**Table 4** Pearson correlation analysis

	GAD-7	PHQ-9	EAT-26
GAD-7	1		
PHQ-9	0.438***	1	
EAT-26	0.594***	0.483***	1

Note: \*\*\* $p<0.001$ , EAT: eating attitude test GAD-7: generalized anxiety disorder 7, PHQ-9: patient health questionnaire 9

**Table 5** Regression analysis results

	GAD-7 (Anxiety)					PHQ-9 (Depression)				
	B	SE	$\beta$	t	p-value	B	SE	$\beta$	t	p-value
<b>EAT-26</b>										
A	1.078	0.123	0.275	8.76	<0.001	1.018	0.105	0.287	9.74	<0.001
B	1.095	0.153	0.218	7.15	<0.001	0.956	0.143	0.186	6.69	<0.001
C	0.938	0.119	0.240	7.89	<0.001	0.818	0.103	0.232	8.02	<0.001
$R^2$	0.34					0.52				

Note: A: dieting, B: Bulimia & food preoccupation, C: oral control, EAT: eating attitude test GAD-7: generalized anxiety disorder 7, PHQ-9: patient health questionnaire 9

to focus more on understanding and addressing the compensatory behavior of college students.

The second predictor, oral control, exhibited a robust correlation with anxiety and depression, indicating its considerable significance in contributing to both mental health conditions. The observed dimension pertains to behaviors focused on regulating food consumption, typically indicative of an underlying issue related to body image and self-esteem, which are frequently linked to anxiety and depressive conditions [71]. The significant correlation observed between oral control behaviors and mental health issues implies that the former serves as a prominent indicator of the latter. This observation aligns with previous research studies that have underscored the psychological strain associated with adhering to stringent control over dietary behaviors [72].

The findings indicate that bulimia and food preoccupation demonstrated relatively lower levels of predictive significance for the manifestation of anxiety and depression. This observation may suggest the intricate manifestation of bulimic behaviors characterized by recurring patterns of excessive eating and subsequent purging. These behaviors are frequently accompanied by emotions of guilt and shame, leading to psychological distress [73]. The correlation between bulimia and mental health has been extensively documented, with a plethora of research studies providing evidence that individuals displaying bulimic behaviors are disproportionately susceptible to experiencing heightened levels of anxiety and depression [74, 75].

The findings of our study are aligned with previous research that has demonstrated a strong association between deteriorating eating attitudes and adverse mental health outcomes [76, 77]. The COVID-19 pandemic introduces a new dimension to these relationships within the given context. The global pandemic has significantly worsened mental health challenges on a worldwide scale, with a considerable impact on adolescents who have experienced disruptions in both their social interactions and academic pursuits [78, 79]. The findings of our study indicate that the stressors related to the pandemic may have exacerbated the association between disordered eating attitudes and mental health in this particular

demographic. This supposition is bolstered by recent scholarly work. Several psychological consequences of the global pandemic have been found, such as elevated levels of stress, anxiety, depression, and suicidal thoughts and behaviors. These emerging trends have been confirmed by several meta-analyses and systematic reviews, highlighting the substantial mental health burden precipitated by the global pandemic. For example, *Barberis et al. (2022)* [80] conducted a review on the prevalence of suicidal behaviors amidst the pandemic. The findings of this analysis demonstrated a marked increase in such occurrences, which was attributed to elevated stress levels, social isolation, and economic uncertainty [81]. The presented evidence is consistent with our research findings, indicating a considerable prevalence of depression and anxiety among high school students in Saudi Arabia amidst the pandemic. This study contributes to the expanding literature on the significance of timely identification and intervention for adolescents with disordered eating attitudes. Based on the identified substantial correlations, educational institutions, and healthcare providers must incorporate screening and support mechanisms to address eating behaviors and mental health issues simultaneously.

#### Study implications

In light of the significant correlations between deteriorated eating patterns and elevated levels of anxiety and depression, our findings underscore the importance of screening for deteriorated eating behaviors as potential indicators of mental health issues among adolescents. This has critical implications for schools, healthcare professionals, and parents, suggesting that early identification and support are crucial in mitigating the adverse effects of these conditions, particularly given the influence of the COVID-19 pandemic on student well-being [82]. Specifically, schools could integrate screening tools and educational programs to promote mental well-being and healthy eating habits. Healthcare professionals should be attentive to the psychological correlates of eating disorders and implement routine screening. Parents play a vital role in fostering open communication and encouraging healthy behaviors. Further research

is needed to explore causal relationships and assess the effectiveness of interventions, contributing to a more comprehensive understanding and approach to adolescent health.

### Limitations

Although the outcome of this investigation holds significance, it is vital to acknowledge the presence of certain limitations. Initially, the sample was comprised solely of individuals residing in a specific location, potentially impeding the extrapolation of our research outcomes to the broader population. Additionally, the questionnaire did not incorporate an investigation of the causal factors attributed to the participants' mental health issues. Ultimately, the assessment of participants' mental health symptoms entailed the utilization of self-report scales. However, it is essential to acknowledge that employing such scales may introduce bias compared to diagnostic interviews. To enhance the precision of diagnoses, it is recommended that forthcoming research incorporates diagnostic interviews. Finally, the study employs a cross-sectional and correlational research design to elucidate the connections between deteriorating eating attitudes and anxiety/depression without however establishing causal relationships. Hence, although significant associations were observed, the precise direction and causality of these associations remain ambiguous. Further longitudinal or experimental studies are required to investigate the causal pathways in greater depth.

### Conclusions

The current investigation established a correlation between anxiety and depression symptoms and the adverse impact they exert on the eating patterns of high school students. This implies that promoting students' mental well-being and adopting a well-rounded dietary regimen necessitate heightened focus by educational institutions, familial units, and additional available support systems. In the realm of secondary education, it is customary for high school students to be tasked with the responsibility of actively pursuing assistance. However, it is worth noting that many of these individuals tend to exhibit a degree of ambivalence towards seeking such support. In the course of our investigation, it emerged that instances of robust mental well-being were frequently concomitant with an array of deteriorated attitudes towards eating-related behaviors. Hence, emphasizing the observation of high school students exhibiting deteriorated eating patterns can aid in the timely identification of their mental health concerns. The findings of this investigation offer valuable knowledge for enhancing clinical interventions and preventive measures adopted within educational institutions, with the ultimate goal of bolstering the mental well-being of high school students.

Moreover, the advancement of information technology has led to the exploration of mobile applications and online tools to bolster mental health support.

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### Author contributions

AM, SR, and WZ are responsible for the conceptualization and design. AM, SR, and AA are responsible for the analysis. AM, AA, WZ, and SR wrote the original draft. AM, AA, WZ, and SR wrote, reviewed, and edited the manuscript. All authors have read and approved the final manuscript.

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### Data availability

The raw data that support the findings of this study are available on request from the authors of the paper.

### Declarations

#### Institutional review board statement

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Review Committee of the Prince Sattam Bin Abdulaziz University, Saudi Arabia (ref: 9142/2022).

#### Informed consent statement

Informed consent was obtained from all subjects involved in the study.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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